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ABSTRACT

This report evaluates the Chapter I Take-Home Computer (THC) Program established in five elementary schools and four middle schools in academic year 1990-91 in the Atlanta (Georgia) Public Schools. The program involved sending 180 computers home for 6-week periods only with those students who had parents who were willing to attend a meeting and work with their children. To evaluate the project, a group of Chapter I eligible students was selected from other schools as a control group. The Iowa Tests of Basic Skills (ITBS) measured the students' achievements in mathematics and reading. No significant difference was observed between the control and experimental students. A second analysis separated scores of elementary school and middle school students. This analysis found a significant difference in the gain for middle school students in mathematics, but not in reading. There were no significant differences in scores for the elementary school students. These findings suggest that for a successful program, the time for the computer to be in the home should be increased, and more middle school students should be involved in the program. Included are 13 tables. Two appendices contain the curriculum outline, evaluation questions, and a summary of parent responses to an evaluation question. (JB)

Evaluation of Chapter I Take-Home Computer Program 1990-91

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Report No. 7, Vol. 28, 12/91

Evaluation of Chapter I
Take-Home Computer Program

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Abstract

The Chapter I Take-Home Computer (THC) Program was established in five elementary schools and four middle schools in academic year 1990-91. One hundred eighty computers were sent home with students for six-week periods, but computers went to only those students whose parents were willing to come to a meeting and agree to work with the child. Log sheets were kept by the child regarding the homework assignments made by the teacher. A questionnaire was sent to parents in order to obtain information about observed differences in learning by the child. The questionnaire included a section for open-ended comments.

A group of Chapter I eligible students was selected by computer from other schools as a control group. The students' achievement was measured by the Iowa Tests of Basic Skills (ITBS) reading and mathematics scores. A multivariate analysis of covariance test was applied to the data with the 1990 ITBS reading and math scores as the covariates. No significant statistical difference was observed between the control and experimental students. The first analysis was of pooled data from elementary and middle school students and was nonsignificant. For the second analysis, scores of elementary and middle school students were separated. A separate analysis was performed for elementary and middle school students. When elementary/middle school gains were compared for math and reading with an analysis of covariance, there was a significant difference in the gain for middle school students in mathematics, but not in reading. There were no significant differences in scores for elementary students. If the goal is increased learning by students, the time for the computer to be in the home needs to be increased, and more middle school students need to be involved in the program.

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Overview

In 1990-91 one hundred eighty Apple IIe Take-Home Computers were offered to students in Chapter I classes in nine schools during first semester and nine schools second semester for a six-week period.

The computers were sent home only to students whose parents came to a meeting and signed an agreement form indicating they understood the responsibilities they were assuming in regard to the computer. Parents also agreed to work with the students each Monday - Thursday evening for twenty minutes.

The purpose and emphasis for the Take-Home Computer (THC) Program was to increase reading and mathematics achievement in Chapter I Take-Home Computer students and to increase parental involvement for Chapter I Take-Home Computer students.

The evaluation of the THC consisted of several different aspects of the program, tied to the stated objectives of the program.

For a comparison of time spent on the computer at home, student journal sheets were returned and the time compared.

In addition, parents were asked to tell, on an average, how long they had worked with their children on homework before the computer arrived and after the computer returned to school. The evaluation also consists of a review of comments made by the parents of the students in the Chapter I classes who took home computers. These first remarks are a response to the question, "What differences do you see in your child's learning as a result of the computer being in your home?"

The final part of the evaluation of the program is a statistical comparison of the Iowa Tests of Basic Skills scores in reading and mathematics comparing Take-Home Computer students' scores with a control group of similar students. Further comparison was made of the progress made by elementary versus middle school students.

Purpose

The first and most important purpose of the Take-Home Computer Program was to help students improve reading and math skills through computer-assisted study and practice at home. Education should be an all-encompassing process; it need not be confined to the classroom or restricted to the hours that school is actually in session. The Take-Home Computer Program expanded the learning environment and encouraged parents to get involved in the educational process of their child. And because a computer was actually "checked out" from the school and taken home, the program also fostered greater skill and confidence in the use of this increasingly important educational tool. Jostens Learnings' Take-Home Computer Program was based on the belief that computer-assisted education can be as effective in the home as it is in the classroom.

Program Design

Instructional

This module consisted of reading, language arts and mathematics instructional diskettes, accompanying student workbooks, all assessment materials, and necessary parent information.

Computer and workbook activities covered levelized skills in the THC continuum. The sequence in which the skills were presented could be modified to reflect the order in which they were presented in school. This feature allowed the program to provide parallel reinforcement of the same skills that youngsters were learning in the classroom. For students performing below grade level, individual skills could be targeted for remediative purposes.

Enrichment

While the instructional modules were intended for use with children enrolled in the program for reading, language arts and mathematics assistance, the enrichment component was intended to be used by the entire family. Ten diskettes provided multiple levels of games or other activities designed to engage parents and children in expanding their vocabulary, exploring famous people and places, developing logical thinking skills, strengthening problem-solving abilities and more. Five "Memorybooks" gave families other enrichment activities to pursue independently of the computer.

Management

Each THC Manager was provided a computer, hard disk and printer which remained at the site. Special management software kept track of all students and maintained information about their progress in the program. Assessment instruments could be scored on the system. The management system generated a number of printed reports that summarized individual and group process. The reports were especially meaningful to share with classroom teachers and parents.

Evaluation Criteria

Most of the schools using the THC Program evaluated its success by measuring achievement gains. Usually, this involved administering pre- and post-tests to acquire growth information.

Observations

Many other participating schools or school districts have conducted informal assessments of the THC Program. Most often, these took the form of parent/student questionnaires.

Method of Delivery

The administration of the program varied somewhat according to local needs and goals, but the general procedure was as follows:

> The computers were lent out to students in "rotational shifts," each group of students having use of the computers and accompanying materials for a predetermined period of time, after which the next group got its turn, and so on.
>
> Along with the computer, the student received several cases of computer programs that related specifically to the skills in the THC continuum, a series of workbooks containing instructional materials on those skills, and a case of enrichment (fun) programs.
>
> Tests were to be administered to students at school to identify their particular weaknesses in the skills of the THC continuum and check for improvement after their participation in the THC Program. Paper/pencil tests were provided. These tests could be graded and the scores recorded on the THC Manager. The THC Manager generated a printed report detailing each student's performance of the various THC skills.

Objectives

1. To improve students' reading and math skills by reinforcing at home the learning that takes place in the classroom.
2. To give students more "time on task."
3. To provide first-hand experience for students in computer literacy, keyboarding, and word processing.
4. To involve parents in the educational process.
5. To encourage parents and students to work together toward a higher level of cooperation and communication.

Role of the Chapter I Coordinator

The Chapter I THC Coordinator, in some cases with the assistance of the educational consultant, had the following responsibilities:

1. Selecting the students who would participate in the program.

2. Compiling participating students' placement levels in reading and math.
3. Contacting the selected families and inviting them to participate in the program.
4. Setting dates and times for parent training workshops and informing all participants.
5. Planning and setting up for parent training workshops.
6. Organizing equipment and materials for distribution.
7. Conducting parent training workshops.

Technical Maintenance

A technical consultant visited the school periodically to repair inoperative hardware, provide preventive maintenance, or deliver replacements when necessary.

Components of the Program

The components of the program were described as follows in the proposal.

The Take-Home Computer carrying case included the following:

- Apple Computer
- Computer Cable
- Monitor Cable
- Apple Monitor (separate)

The book bag contained these items:

- Disk Drive
- 4-5 Diskette Cases
  Each book bag will contain Case 1 and Case 2 for both reading and math skills. The yellow enrichment case which contains 10 diskettes will be issued to the participating students after five weeks into the THC Program. However, they may be previewed at the THC Parent Training Workshop.

Instructional reference materials:

- Parent Guide
  Parent Guides can be used at the THC Parent Training Workshop. Copies are available if parents desire to keep one.
- Memorybooks
  A set of Memorybooks are available for each Chapter I Coordinator. Additional Memorybooks can be ordered if necessary.
- Placement Test Booklets and Answer Sheets.

- **Parent Training Workshop Folder and Student Workbooks**
  Each folder will contain Basic Skills workbooks in reading and math with accompanying answer keys. Applications workbooks will be issued when the student returns his/her computer.

Location of the Computers

During 1990-91, the computers were placed with Chapter I students in Cook, English Avenue, Harwell Road, Mitchell and West Manor Elementary Schools and the following middle schools -- King, Long, Price and Sylvan. Two rotations of the computers in the first semester provided two groups of students opportunities to learn with the computers. Second semester provided another group of students in the same schools an opportunity to take the computers home.

Since the ITBS testing program came during the second rotation of the second semester, only those students who were involved in the program during the first rotation of second semester were evaluated.

Responses

Time Reported Working on Homework with Child

In May 1991, questionnaires were sent to each THC student's parent asking for information and comments, and each teacher was asked to send in the students' log or journal papers. Parental responses are reported for those parents who returned the questionnaire.

Parents of all THC students were asked in the evaluation to indicate the amount of time they spent working with their child on homework before the computer came and afterwards. Since one of the goals was to encourage parents and students to work together, it was important to note the time involved before and after the impact of the computer.

Prior to the computer coming into the home 138 parents responding indicated they spent 30 to 60 minutes working with their child on homework each Monday through Thursday evening, and 34 indicated 61-90 minutes. While the computer was in the home, more parents (52) indicated they spent 31-90 minutes helping the child, and the number indicating a helping time of 2 hours rose from 3 to 11. However, after the computer left the home, the numbers declined, and the largest group (115) indicated they spent 30-60 minutes helping their child.

Tables 1 through 4 show how the parents responded to the questions regarding the time spent helping their child with homework.

TABLE 1

PARENT RESPONSES

SUMMARY BY SCHOOL

Responses to Question 1

Before your child brought home the computer in the Take-Home Computer Program, approximately how many minutes did you spend working with your child on homework each Monday through Thursday evening?

School	None	1 Hour 30-60 minutes	1-1½ Hours 61-90 minutes	2 Hours 91-120 minutes	> 2 Hours >121 minutes	N
Cook	1	6	1	2	0	10
English Ave.	1	11	2	2	1	17
Harwell	0	21	8	1	1	31
Mitchell	1	8	4	2	0	15
West Manor	1	6	5	3	0	15
Total	4	52	20	10	2	88
King	6	26	2	0	0	34
Long	1	30	6	2	0	39
Price	2	14	0	0	0	16
Sylvan	5	16	6	1	0	28
Total	14	86	14	3	0	117

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TABLE 2

PARENT RESPONSES

SUMMARY BY SCHOOL

Responses to Question 2

While the computer was in your home how much time did you spend working with your child on homework each Monday through Thursday evening?

School	None	1 Hour 30-60 minutes	1-1½ Hours 61-90 minutes	2 Hours 91-120 minutes	> 2 Hours > 121 minutes	N
Cook	0	4	4	2	0	10
English Ave.	1	7	8	1	0	17
Harwell	1	18	8	4	0	31
Mitchell	0	7	5	1	2	15
West Manor	1	5	5	4	0	15
Total	3	41	30	12	2	88
King	0	25	6	1	2	34
Long	2	19	6	7	5	39
Price	2	7	4	1	2	16
Sylvan	2	17	6	2	1	28
Total	6	58	22	11	10	117

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TABLE 3

PARENT RESPONSES

SUMMARY BY SCHOOL

Responses to Question 3

After the computer was returned to the school, how much time do you spend working with your child on homework each Monday through Thursday evening?

School	None	1 Hour 30-60 minutes	1-1½ Hours 61-90 minutes	2 Hours 91-120 minutes	> 2 Hours > 121 minutes	N
Cook	0	7	2	0	1	10
English Ave.	2	8	3	2	1	17
Harwell	3	23	4	1	0	31
Mitchell	1	6	5	2	1	15
West Manor	1	7	6	1	0	15
Total		51	20	6	3	88
King	2	22	7	1	2	34
Long	4	23	7	5	0	39
Price	4	6	4	2	0	16
Sylvan	5	13	9	1	0	28
Total	15	64	27	9	2	117

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TABLE 4

SUMMARY OF RESPONSES TO QUESTIONS

Question	None	30-60 minutes	61-90 minutes	91-120 minutes	> 2 Hours	N
1 Before your child brought home the computer in the Take-Home Computer Program, approximately how many minutes did you spend working with your child on homework each Monday through Thursday evening?	18	138	34	13	2	206
2 While the computer was in your home how much time did you spend working with your child on homework each Monday through Thursday evening?	9	109	52	23	12	206
3 After the computer was returned to the school, how much time do you spend working with your child on homework each Monday through Thursday evening?	22	115	47	15	5	206

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Students kept Journal Pages (sample Appendix A) indicating the time spent each evening on the computer, and the score and rating given by the computer program. A limited number (48) were returned as they were retained by the students. An average of 22.23 minutes was spent by those students whose journal pages were returned. Twenty minutes was the recommended amount of time.

Parent Opinions

Parents were asked to respond to two questions. Question Number 3 asked what differences they saw in their child's learning as a result of the computer being in their home. Further, open-ended comments about the program were requested from parents.

Parents believed there was a difference in the child's learning while the computer was in the home. Differences parents observed included increase in interest and time on task, improvement in language and mathematics skills, improved ability to follow directions, development of independent learning skills and work habits. Overall improvement was seen both by elementary and middle school students and often an increase in classroom grades and homework performance.

In addition an increase in responsibility and independence was noticed.

Some parents indicated that they did not see much improvement by the students during the time the computer was in the home. Parents expressed their appreciation for the use of the computer, for some of them indicated they were learning also. A summary of responses for all schools can be found in Appendix B.

Gains in Iowa Tests of Basic Skills Scores

The Take-Home Computer Program enabled selected Chapter I students in five middle schools and four elementary schools to have computers and planned assignments in their homes for six weeks during the year.

The experimental group was matched with a control group of Chapter I students from schools similar to the experimental schools. No controls were taken from the experimental schools. One requirement for involvement in the THC program was the willingness of the parent to come to a meeting and agree to work with this child four evenings a week. If the experimental schools were used for the control students, the controls would be Chapter I students whose parents did not agree to come to the meeting. To get beyond this, the control students were chosen by computer from Chapter I classes in 77 schools similar to the experimental schools.

Students in the control and experimental groups were administered the Iowa Tests of Basic Skills (ITBS) during the regular testing program.

The objectives of the THC program were to improve students' reading and mathematics skills. To measure the improvement, the gain in ITBS mean reading and mathematics scores was measured from spring 1990 to spring 1991.

Table 5 provides the mean gain scores for each control school in reading and mathematics. Table 6 provides the mean gain scores for each experimental school in reading and mathematics. It can be seen that the computer chose similar students to the experimental students from a similar pool of students throughout the system.

TABLE 5

MEAN GAINS -- READING AND MATHEMATICS FOR
CONTROL STUDENTS IN ELEMENTARY/MIDDLE SCHOOLS

Elementary School	N	Mean Gain Reading	N	Mean Gain Math
Adamsville	4	-5.00	4	-1.50
Anderson Park	1	33.00	1	-9.00
Arkwright	4	-3.25	4	4.50
Beecher Hills	1	6.00	1	19.00
Ben Hill	3	7.00	3	-18.33
Capitol View	1	22.00	1	6.00
Cascade	1	21.00	2	-5.00
Collier Heights	3	-2.66	3	-9.33
Connally	6	7.33	5	-4.60
Continental Colony	2	21.00	2	21.00
Dunbar	1	-15.00	1	-24.00
Fain	4	4.25	3	-12.33
Fickett	2	12.00	2	3.00
Gideons	7	-6.42	7	-5.57
Harris	1	19.00	1	-7.00
Hutchinson	2	10.50	2	-3.50
Kimberly	4	.75	4	-7.00
Miles	1	-16.00	2	-6.50
Perkerson	3	15.66	3	10.00
Peyton Forest	2	2.00	2	-1.00
Rusk	2	44.50	2	1.00
Stanton, F. L.	3	-5.00	3	.00
Venetian	5	-2.60	4	-6.00
West Atlanta	1	15.00	1	36.00
Benteen	1	15.00	1	24.00
Blair Village	4	3.25	3	-21.66

TABLE 5 (Continued)

MEAN GAINS -- READING AND MATHEMATICS FOR CONTROL STUDENTS IN ELEMENTARY/MIDDLE SCHOOLS

Elementary School	N	Mean Gain Reading	N	Mean Gain Math
Cleveland Avenue	1	5.00	1	-10.00
Dobbs	1	4.00	1	-1.00
Drew	2	-16.00	2	-5.50
East Lake	2	3.5	2	.00
Gordon	5	13.2	5	8.00
Guice	3	-12.33	3	-3.66
Harwell	3	6.66	3	4.00
Hubert	1	-2.00	1	-40.00
Humphries	1	-13.00	1	-7.00
Kirkwood	3	9.66	3	27.66
Lakewood	3	-24.33	3	-12.66
Lin	1	-8.00	1	-14.00
McGill	2	28.50	2	-2.00
Peterson	2	12.00	2	-5.50
Slater	6	3.16	7	-5.42
Slaton	3	-9.00	4	-5.00
Stanton, D. H.	6	.16	6	-2.33
Thomasville Heights	1	44.00	1	24.00
Toomer	3	5.33	3	4.66
Waters	3	5.66	3	23.66
West	2	5.50	2	-4.00
Whitefoord	5	12.20	5	11.00
Bethune	4	19.50	4	4.25
Blalock	7	1.71	7	8.00
Boyd	1	2.00	1	12.00
Carey	2	33.50	2	-23.00

TABLE 5 (Continued)

MEAN GAINS -- READING AND MATHEMATICS FOR CONTROL STUDENTS IN ELEMENTARY/MIDDLE SCHOOLS

Elementary School	N	Mean Gain Reading	N	Mean Gain Math
Carter	3	14.33	3	5.66
Fowler	2	-4.50	2	-26.50
Garden Hills	4	3.50	4	-14.50
Grove Park	7	10.28	8	9.37
Herndon	5	2.20	5	-10.00
Hill	1	-7.00	1	-23.00
Hope	3	-1.00	3	-19.66
Jones, M. A.	1	-24.00	1	-35.00
Oglethorpe	3	.66	3	2.33
Pitts	9	-6.88	10	-13.80
Rivers	1	-16.00	1	-9.00
Scott	5	-2.00	5	6.40
Towns	2	-6.00	2	-14.50
Williams, A. D.	2	18.50	2	4.5
Woodson	5	14.00	5	13.20
Middle School				
Bunche	32	6.75	31	8.64
Parks	20	-8.80	19	-11.26
Southwest	20	8.00	20	-1.30
Turner	10	.30	10	-4.50
Coan	40	-3.90	39	-10.48
Jones, J. M.	1	11.00	1	-3.00
Marshall	24	-1.08	25	-.24
Inman	11	-10.18	11	-.81
Kennedy	15	4.40	15	-.86
Walden	19	-1.57	19	-9.05

TABLE 6

MEAN GAINS -- READING AND MATHEMATICS FOR
EXPERIMENTAL STUDENTS IN ELEMENTARY/MIDDLE SCHOOLS

Elementary School	N	Mean Gain Reading	N	Mean Gain Math
Harwell	46	-1.69	46	-9.10
West Manor	28	.92	30	2.23
Cook	27	-.74	26	-8.11
English Avenue	57	5.85	56	3.30
Mitchell	29	2.79	28	6.39
Middle School				
Sylvan	51	1.13	49	-.20
King	45	-.93	43	.46
Long	44	.22	46	3.86
Price	40	-.85	39	2.76

In Table 7, the experimental group mean gain scores in reading are provided. The 1990 mean scores for reading and mathematics and the 1991 mean scores for reading and mathematics are provided in Tables 7 and 8 as well as the gains.

TABLE 7
EXPERIMENTAL GROUP
IOWA TESTS OF BASIC SKILLS (ITBS) READING
MEAN NCE SCORES READING

Elementary School	1990 Mean		1991 Mean		Mean Gain	
	Score	N	Score	N	Score	Matched Pairs
Cook	30.7241	29	31.8333	30	-.7407	27
English Avenue	31.6610	59	37.6333	60	5.8596	57
Harwell	35.1020	49	33.7500	48	-1.6957	46
Mitchell	36.9375	32	40.5000	30	11.7150	29
West Manor	36.8000	30	36.8333	30	.9286	28
Middle School						
King	29.2083	48	27.9348	46	-.9333	45
Long	35.1667	48	35.2653	49	12.8857	44
Price	34.0930	43	33.8372	43	1.1373	51
Sylvan	32.7358	53	33.6731	52	12.8857	44

TABLE 8

EXPERIMENTAL GROUP
IOWA TESTS OF BASIC SKILLS (ITBS) MATHEMATICS
MEAN NCE SCORES MATHEMATICS

Elementary School	1990 Mean		1991 Mean		Mean Gain	
	Score	N	Score	N	Difference	Matched Pairs
Cook	37.0690	29	32.8333	30	-8.1154	26
English Avenue	37.9138	58	41.3051	59	3.3036	56
Harwell	40.0204	49	31.3750	48	-9.1087	46
Mitchell	38.1613	31	43.2333	30	6.3929	28
West Manor	37.1333	30	38.8065	31	2.2333	30
Middle School						
King	32.4375	48	33.8222	45	.4651	43
Long	36.7292	48	40.5000	48	3.8696	46
Price	33.0302	43	37.4286	42	2.7692	39
Sylvan	35.3208	53	35.7885	52	-.2041	49

In Tables 9 and 10, the entire group is broken into subgroups for elementary and middle, control and experimental with the mean gain scores for each group shown. Table 9 is reading, and Table 10 is mathematics.

TABLE 9

CONTROL AND EXPERIMENTAL SCHOOLS
IOWA TESTS OF BASIC SKILLS (ITBS) READING NCE MEAN GAIN SCORES
1990-1991

Group	Mean Gain Scores	Standard Deviation	N
Elementary Control	3.9231	19.2319	195
Experimental	1.8342	16.8481	187
Middle Control	-.2292	17.7714	192
Experimental	-.0444	14.0680	180

TABLE 10

CONTROL AND EXPERIMENTAL SCHOOLS
IOWA TESTS OF BASIC SKILLS (ITBS) MATHEMATICS MEAN GAIN SCORES
1990-1991

Group	Mean Gain Scores	Standard Deviation	N
Elementary Control	-1.6802	19.5112	197
Experimental	-1.0699	19.5288	186
Middle Control	-3.3105	15.7158	190
Experimental	1.6723	12.6723	177

Table 11 provides the Observed and Adjusted Mean scores for reading and mathematics for the control and experimental groups adjusted for the 1990 NCE mean scores.

TABLE 11

MEAN IOWA TESTS OF BASIC SKILLS (ITBS) NCE SCORES
ADJUSTED BY 1990 MEAN NCE SCORES
READING AND MATHEMATICS

Group		Observed Mean	Adjusted Mean
Reading Control	90	34.49020	34.49020
	91	38.24020	38.09338
Experimental	90	34.11579	34.11579
	91	36.12105	36.26787
Mathematics Control	90	39.93627	39.93627
	91	38.31373	37.94926
Experimental	90	38.33158	38.33158
	91	37.19474	37.55920

A regression coefficient was computed within the cells to determine if the scores are related. This within cell regression was significant showing it was appropriate to proceed with the multivariate analysis test. Overall, there is a significant difference for the total groups in their performance on the variable.

Hotellings multivariate test of significance had an F = 4.95289 with a significance p = .007. There was significance and group effect between the two groups -- control and experimental students, when the data for elementary and middle schools are combined.

Two statistical tests were performed in order to determine the appropriateness of a MANCOVA with the data. The first was a multivariate within cells regression which needed to be significant for the multivariate test to succeed. It was significant. (Hotellings F approximately 54.501 p < .0001) The second test was conducted in order to determine if the multivariate regression planes were parallel. This test should not be significant (significance indicates convergence), and it was not (F = 1.69647 p = .148). Thus we can be confident that the MANCOVA used to analyze these data is appropriate.

A test done to determine if the hyper planes of Math NCE '90 scores and Reading NCE '90 scores by group are parallel, indicated there was no significan. difference, which means that the two planes can be considered to be parallel. (F for Wilkes Lambda = 1.69647 p = .148)

There was no significant difference in the two groups overall for the previous year (Reading F = 2.63926, p = .105; Mathematics F = 2.93174, p = .087).

It was decided to look at the data in the factors of elementary and middle school groups to determine significance of gain in scores.

A comparison was made of the elementary school control and experimental groups. A within cells regression showed F = 23.56472 for Wilkes Lambda p = .000. Therefore, the regression was significant within the cells (Reading F = 17.86339, p = .000; Mathematics F = 39.2860, p = .000).

A group effect for the elementary school effect was not significant (F = .77862 p = .460). The multivariate test was significant.

A univariate ANOVA in Table 12 report indicated F = .05410 for math NCE scores (p = .816) and F = 1.35210 for reading NCE (p = .246). A multivariate test of significance (Wilkes Lambda) was computed on these data and showed F = .49270 p = .741. We find the planes are parallel which indicates this univariate test was valid because the hyper planes do not interact, that is the pre conditions are met for use of the test as they must be parallel for the analysis to be appropriate.

TABLE 12

ELEMENTARY SCHOOLS UNIVARIATE F
MATHEMATICS AND READING

Factor	Observed Mean	Adjusted Mean	F	Significance
Math NCE 91	37.19474	37.55920	.05410	.816
Reading NCE 91	36.12105	36.26787	1.35210	.246

A comparison of mathematics NCE 1991 scores and reading NCE 1991 scores between control and experimental groups reveals no significant differences exist. (Mathematics NCE scores, $F = 1.19412$, $p = .27$) (Reading NCE scores, $F = .08038$, $p = .777$).

A multivariate analysis of covariance was computed in reading to compare the performance of middle school experimental and control group students on the 1991 ITBS in reading and mathematics. Results indicated that a significant difference existed between the groups ($F = 7.586$, $p = .001$). Univariate F tests revealed a significant difference in mathematics ($F = 10.38922$, $p = .001$) but not in reading ($F = 1.09709$, $p = .296$) as represented in Table 13.

TABLE 13

MIDDLE SCHOOLS UNIVARIATE F
MATHEMATICS AND READING

Factor	Observed Mean	Adjusted Mean	F	Significance
Math NCE 91	34.14213	33.32948	10.38922	.001
Reading NCE 91	35.34518	34.81715	1.09709	.296

An examination of ITBS 1990 mathematics NCE and reading NCE scores for experimental and control group students indicated that control group students did not significantly outperform experimental group students ($F = .08601$, $p = .769$) in reading, and there was no significant difference in mathematics 1990 scores between the groups ($F = .98621$, $p = .321$). Thus, experimental group students' scores rose from nonsignificance to significance when compared to the scores of control group students from 1990 to 1991 in mathematics.

In order to test the hyper planes, a multivariate Wilkes Lambda test of significance, ($F = 2.35993$, $p = .052$) indicated the hyper planes are parallel and therefore, the analysis was appropriate and accurate. They probably do interact but do not do so significantly. Therefore, the test is valid.

The two groups have to be similar groups before a statistical comparison can be made. The use of the covariate makes them similar in gains.

In summary we find a significant gain in NCE scores utilizing Analysis of Covariance with the covariate being the 1990 NCE scores, only in the mathematics for middle school students.

There was not enough gain in NCE scores for the overall experimental students to have significant gain in an appropriate test, in reading or mathematics or for elementary students to have significant gains in reading or mathematics. In fact, the only significant gains were made by middle school students in mathematics, but not in reading.

Observations and Recommendations

The findings of the 1990-91 students in the Take-Home Computer program are the same as for the 1989-90 students.

The assumption in the THC program is that six weeks' work with a computer in the home combined with assigned homework will make a learning difference which can be measured on the mathematics and reading portion of the Iowa Tests of Basic Skills.

After a close scrutiny utilizing analysis of covariance, the gain in mathematics for middle school students was a significant gain. No other gains were significant for elementary or middle school age students.

For two years the findings are similar. It is recommended that the computers be placed in homes of middle school students for a longer time period to determine if the gains can be increased.

R&E
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1/28/92

APPENDICES

APPENDIX A

THC Curriculum Outline and Evaluation Questions

CHAPTER I
TAKE-HOME COMPUTER PROGRAM

Reading Skills Continuum

LEVEL 4, 5, 6, and 7

Context Clues
Synonyms / Antonyms / Homonyms
Homographs (Multiple Meanings)
Prefixes / Suffixes
Root Words
Content Vocabulary
Analogies
Predicting Outcomes / Drawing Conclusions
Recalling Details
Determining Main Idea
Sequencing
Cause and Effect
Fact and Opinion
Compare and Contrast
Read Graphs / Tables / Maps
Punctuation
Capitalization
Usage

Math Skills Continuum

LEVEL 4

Read, Write and Recognize Numerals
Missing Numerals in Sequence
Place Value to 7 Digits
Rounding to 6 Digits
Multiplying 2, 3, 4 by 2-Digits
Multiplying Multiples of 10
Dividing 3, 4 Digits by 1 Digit
Dividing 2, 3 Digits by 2 Digit
Fractional Equivalent / Lowest Terms
Addition of Fractions / Like Denominators
Geometric Terms
Parallel and Perpendicular Lines
Congruent Lines and Figures
Concept of Perimeter
Linear Measure / Weight / Capacity
Determining Averages
Word Problems, All Operations

(OVER)

Case 2

Diskette 16	*Division by 2 Digit - 1*
Diskette 17	*Division by 2 Digit - 2*
Diskette 18	*Division by 3 Digit - 1*
Diskette 19	*Division by 3 Digit - 2*
Diskette 20	*Division by 3 Digit - 3*
Diskette 21	*Fractions - 1*
Diskette 22	*Fractions - 2*
Diskette 23	*Adding Fractions - Like Denominators - 1*
Diskette 24	*Adding Fractions - Like Denominators - 2*
Diskette 25	*Geometry and Measurement - 1*
Diskette 26	*Geometry and Measurement - 2*
Diskette 27	*Word Problems - Addition*
Diskette 28	*Word Problems - Subtraction*
Diskette 29	*Word Problems - Multiplication*
Diskette 30	*Word Problems - Division*

LEVEL 5

Case 1

Diskette 1	*Comprehending Numerals to 9-Digits - 1*
Diskette 2	*Comprehending Numerals to 9-Digits - 2*
Diskette 3	*Comprehending Numerals to 9-Digits - 3*
Diskette 4	*Comprehending Numerals to 9-Digits - 4*
Diskette 5	*Comprehending Decimals to Thousandths - 1*
Diskette 6	*Comprehending Decimals to Thousandths - 2*
Diskette 7	*Comprehending Decimals to Thousandths - 3*
Diskette 8	*Comprehending Decimals to Thousandths - 4*
Diskette 9	*Comprehending Decimals to Thousandths - 5*
Diskette 10	*Place Value to 10 Digits - 1*
Diskette 11	*Place Value to 10 Digits - 2*
Diskette 12	*Rounding Numerals to 9 Digits*
Diskette 13	*Comparing Fractions w/Like Denominators - 1*
Diskette 14	*Comparing Fractions w/Like Denominators - 2*

Case 2

Diskette 15	*Fractions/Addition and Subtraction - 1*
Diskette 16	*Fractions/Addition and Subtraction - 2*
Diskette 17	*Fractions/Addition and Subtraction - 3*
Diskette 18	*Fractions/Addition and Subtraction - 4*
Diskette 19	*Fractions/Addition and Subtraction - 5*
Diskette 20	*Decimals/Addition and Subtraction - 1*
Diskette 21	*Decimals/Addition and Subtraction - 2*
Diskette 22	*Angles 1*
Diskette 23	*Angles 2*
Diskette 24	*Angles 3*
Diskette 25	*Angles 4*
Diskette 26	*2-Step Word Problems - 1*
Diskette 27	*2-Step Word Problems - 2*
Diskette 28	*2-Step Word Problems - 3*
Diskette 29	*2-Step Word Problems - 4*

CHAPTER I
TAKE-HOME COMPUTER PROGRAM
COORDINATORS' INSERVICE

AGENDA

MORNING SESSION

Welcome and Introductions

Objectives

Program Overview

Program Components

Program Operational Sequence

Parent Training Workshop

Open Discussion

AFTERNOON SESSION

THC Parent Training Workshop Simulation

ATLANTA PUBLIC SCHOOLS * JOSTENS LEARNING CORPORATION
TAKE-HOME COMPUTER PROGRAM

Dear Parent,

We're pleased that you have accepted our invitation to take part in the Take-Home Computer Program. We're sure you'll find that, over the course of the next few weeks, participating in the program will be a worthwhile experience for both you and your child.

As you are now aware, one of the major components of the program allows you to take a computer and software home for use with your child. You have just learned how to assemble the computer and have become familiar with how the computer operates.

Prior to borrowing a computer, it's necessary for you to sign the agreement form below assuring us that you're aware of your responsibilities regarding the computer's use.

Thank you for your cooperation.

Sincerely,

_____

_____

I, the undersigned parent, understand that I am responsible for the child's borrowed computer in the following ways:

1. I will see that the computer is used properly in my home.
2. I will follow the correct procedures in assembling the computer.
3. If I experience any problems with the computer equipment, I will notify the school and explain what I think is wrong with the system.
4. If the computer or any of its accompanying components are stolen, I will notify the police and submit the resulting police report to the school.

Monitor Serial No.	Disk Drive Serial No.	Keyboard Serial No.

Parent's Signature	Date
Program Supervisor	Date

Level

STUDENT'S NAME: ____________________

Journal Pages

Date:	Type of Activity:	Time Spent:	Score:	Rating:

ATLANTA PUBLIC SCHOOLS

Department of Research and Evaluation
210 Pryor Street, S.W.
Atlanta, Georgia 30335

April 22, 1991

Dear Parents of
Take-Home Computer Students:

Your child participated in the Take-Home Computer Program earlier this year. As part of our evaluation of the program, we need some information. Please answer the questions below and return the questionnaire with your child to the Chapter I teacher tomorrow. Your help and time are appreciated.

1. Before your child brought home the computer in the Take-Home Computer Program, approximately how many minutes did you spend working with your child on homework each Monday through Thursday evening?

_____none _____30-60 minutes (1hour) _____61-90 minutes (1-1/2 hours)

_____91-120 minutes (2 hours) _____121 minutes or more (more than 2 hours)

2. While the computer was in your home how much time did you spend working with you child on homework each Monday through Thursday evening?

_____none _____30-60 minutes (1hour) _____61-90 minutes (1-1/2 hours)

_____91-120 minutes (2 hours) _____121 minutes or more (more than 2 hours)

3. After the computer was returned to the school, how much time do you spend working with your child on homework each Monday through Thursday evening?

_____none _____30-60 minutes (1hour) _____61-90 minutes (1-1/2 hours)

_____91-120 minutes (2 hours) _____121 minutes or more (more than 2 hours)

4. What differences do you see in your child as a result of the computer being in your home?

_____

_____

_____

_____

Please add any comments you would like to make about the Take-Home Computer Program.

_____

_____

_____

_____

Thank you.

Sincerely,

Lowrie A. Fraser

Lowrie A. Fraser, Ph.D.
Researcher

Enclosure

LAF:aap

xc: Dr. Lester W. Butts
Dr. Alvin A. Dawson
Dr. Everett E. Abney
Dr. Myrtice M. Taylor
Assistant Superintendents
Dr. Ethel Blayton
Principals
Chapter I Teachers

APPENDIX B

Summary of Parental Responses to Evaluation Question 4

SUMMARY OF PARENTS' RESPONSES BY SCHOOL

4. What differences do you see in your child as a result of the computer being in your home?

Numbers equal number of responses
No number equals single response

Cook

4 - Improved her reading and math
Increased interest in computers
Getting good grades
2 - She/he is more expressive

English Avenue

3 - She did homework better
6 - Improved in reading and math
5 - Showed more interest, enthusiasm
She stayed in the house
2 - More patience doing her homework

Harwell Road

He felt very important
13 - More interested in her work
2 - Increased awareness of importance of computer
Faster with her work
He stayed home more
2 - Little difference in his work
8 - Great improvement in math and reading
It was broke

Long

15 - Grades improved in reading and math
She would like to have computer now
2 - He tries to read more now
4 - Showed independence in responsibility
2 - We spend more time together
2 - I am learning from the program

Price

6 - My child does much better in school (doing homework)
4 - Improved in reading and math
Improved work habits and self-confidence
Takes her away from TV
Excitement

Sylvan

11 - Does better in class
2 - Do not see differences in my home
We work together more
4 - We spent a lot of time on your computer
3 - I am very responsible

Mitchell

Not much
2 - Helped in understanding the concepts
She enjoyed it
5 - Improved reading and math
3 - He works independently more
He only could work on computer on weekends

West Manor

Very helpful
2 - More enthusiasm
2 - Better understanding
6 - Improved reading and math
Attacked weak skills previously noted
Enjoyed it
1 - None

King

2 - Greater interest in math and reading
5 - Spends more time doing homework
11 - Improved his skills (grades-reading and math)
We worked together more
2 - Interest increased
I had to always tell him to use it
His work did not improve
5 - Please add any comments you would like to make about the Take-Home Computer Program

Cook

4 - My child benefited greatly - increased understanding
2 - I would like to participate again

English Avenue

We used it together
4 - Would like to participate again
4 - Thank you very much
2 - Good
Makes school more challenging
I loved and enjoyed it being in my home
Some disks seemed to have wrong answers
More competent

Harwell

14 - Great value - Would like to participate more
2 - Work was more fun and easier
2 - Really enjoyed it and child studies harder
5 - Thank you

Mitchell

Workbooks are very useful
6 - A great learning experience for both of us
Do not give the game disc until the end
Everyone should have the opportunity

West Manor

3 - Thank you
Reinforced independence
3 - Hope to participate again
More children should be exposed to program
2 - Enjoyed by both of us

King

10 - Good opportunity/program
Showed him fractions and decimals
I enjoyed it more than him
2 - He did not work with it as he should (did not like it)
2 - I hope we can participate again
2 - I hope to buy one, one day

Long

8 - Would like to participate again
6 - Was nice to have his interest in school increased
5 - Good opportunity
Improve tapes to enhance textbook, not copy it
2 - We appreciate opportunity to participate
3 - Every child should have opportunity
2 - I would like to buy one for my child
6 - Enjoyed it

Price

Increases eagerness a d determination to hear
Program is good in helping my child learn more in reading and math
It is a great thing that has happened in our home
Every child should be able to participate
3 - I would like to see the program continued
Challenging experience
Helps them with their homework
Fun and exciting

Sylvan

3 - It helps the children a lot
9 - I would like to participate again
8 - We enjoyed it very much
It is not for me

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